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Geographical Setting

of the

MISSOURI RIVER VALLEY

between

Kansas City and St. Joseph

by

Wakefield Dort, Jr.

Annual Meeting

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Figure 1 is redrawn from Flint, Glacial and Quaternary Geology, 1971, Figure 21-1.

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GEOGRAPHICAL SETTING OF THE MISSOURI RIVER VALLEY BETWEEN KANSAS CITY AND ST. JOSEPH

Geography relates Man and his activities to the natural environment. The many threads of a subject of such all-inclusive scope interweave in an almost endless array of possibilities. A really thorough geographical description and discussion of even so small an area as a 60-mile-long stretch of a river valley could fill a large volume. The following sections offer highlights of only some aspects of the subject.

BEDROCK GEOLOGY

A bit more than 200,000,000 years ago, during that part of geologic time that has been named the Pennsylvanian Period, the region which is now central United States was a plains area of low relief and very low altitude. Recurrent though small movements either of the land or of mean sea level caused numerous alternations of marine and terrestrial conditions. During episodes of submergence, calcareous muds and oozes accumulated on the floor of the shallow sea; during emergence, vast freshwater swamps were the loci of deposition of carbonaceous mud, peat, and occasional streamlaid silt and sand. Subsequent lithification of these sediments has produced alternating series of limestone and shale with minor amounts of sandstone, coal, and underclay.

In the Kansas City area, slight warping caused a gentle westerly inclination of the strata. Later erosion truncated the sedimentary units, producing outcrop bands oriented in a northeasterly-southwesterly

direction. As a consequence, a journey up the Missouri Valley from Kansas City encounters exposures of progressively younger formations, or, to express the relationship another way, rocks visible at the surface at Kansas City are several hundred feet underground at Atchison.

The nature of the bedrock in the Kansas City area is of geographical importance to both natural resources and topography. Some of the limestone formations, either purer or thicker and more massive than others, have been quarried for Portland and masonry cement, lime, and, especially in past decades, for dimension stone for construction. Some clay and shale are made into brick and light-weight aggregate. Certain of the limestone units in the vicinity of Leavenworth and Atchison and, especially, Kansas City are so thick and massive that they are actually mined by room-and-pillar underground operations rather than open-pit quarries. Some of the resultant spaces have been converted to controlled-atmosphere and security storage areas or even, in Kansas City, sites of office, warehouse, and manufacturing operations.

The coal beds are discontinuous, impure, and generally too thin for commercial exploitation. Small, usually family-run mines have at times worked the thicker parts of seams (up to about 6 inches) to supply strictly local markets. There has been no active mining for several decades. Minor oil production has been secured from the shallow Belgium Bottoms Pool located beneath the Missouri River floodplain just north of Kansas City, Kansas.

In the effectively sub-humid climatic regime of the Kansas City area, limestone is often a relatively resistent rock, especially the more massive layers lacking numerous bedding planes or closely-spaced joints. As a consequence, local upland surfaces tend to parallel the very gentle westerly inclination

of the bedrock units, and valleyside slopes often are interrupted by minor bedrock terraces. The fact that there has been no major uplift or deformation of the strata since the original accumulation in Pennsylvanian seas has determined the general low-elevation plains aspect of this region.

The gentle regional decrease in upland elevations from west to east appears to be a general consequence of eastward drainage from the Rocky Mountains to the Mississippi River at the axis of the continent. More precisely, this eastward slope may have been inherited from a time, a few million years ago, when streams, vigorously eroding the recently-uplifted Rockies, spread eastward a vast, gently sloping sheet of debris, perhaps all the way to the Mississippi.

QUATERNARY EVENTS AND CLIMATE

Events that occurred during the Quaternary Period (Pleistocene and Recent Epochs) are largely responsible for the landscape that we see today. Indeed, most of the actual land surfaces received their final shaping within the last few thousand, or even few hundred years. Nevertheless, present landforms must be interpreted within the framework of the entire Quaternary historical sequence, a sequence that has been very strongly influenced by radical variations in climatic parameters and reversals in the trends of climatic change.

The area of northeastern Kansas and northwestern Missouri was directly affected by continental ice sheets during only the first two of the generally-recognized four major glaciations of Pleistocene time. Records of the earliest or Nebraskan Glaciation are

sparse and obscure, but it is believed that the ice advanced only as far as the general vicinity of Atchison in Kansas and a bit farther in central Missouri (Fig. 1). Ice of the second or Kansan Glaciation exceeded these limits by at most a few tens of miles. The later, Illinoian and Wisconsin glaciations terminated in central and northern Iowa. Recent studies along and west of the Missouri Valley in Kansas and Nebraska have shown that there actually were several advances and retreats of both the Nebraskan and Kansan ice sheets similar to the much better known oscillations of the ice fronts during Illinoian and Wisconsin time.

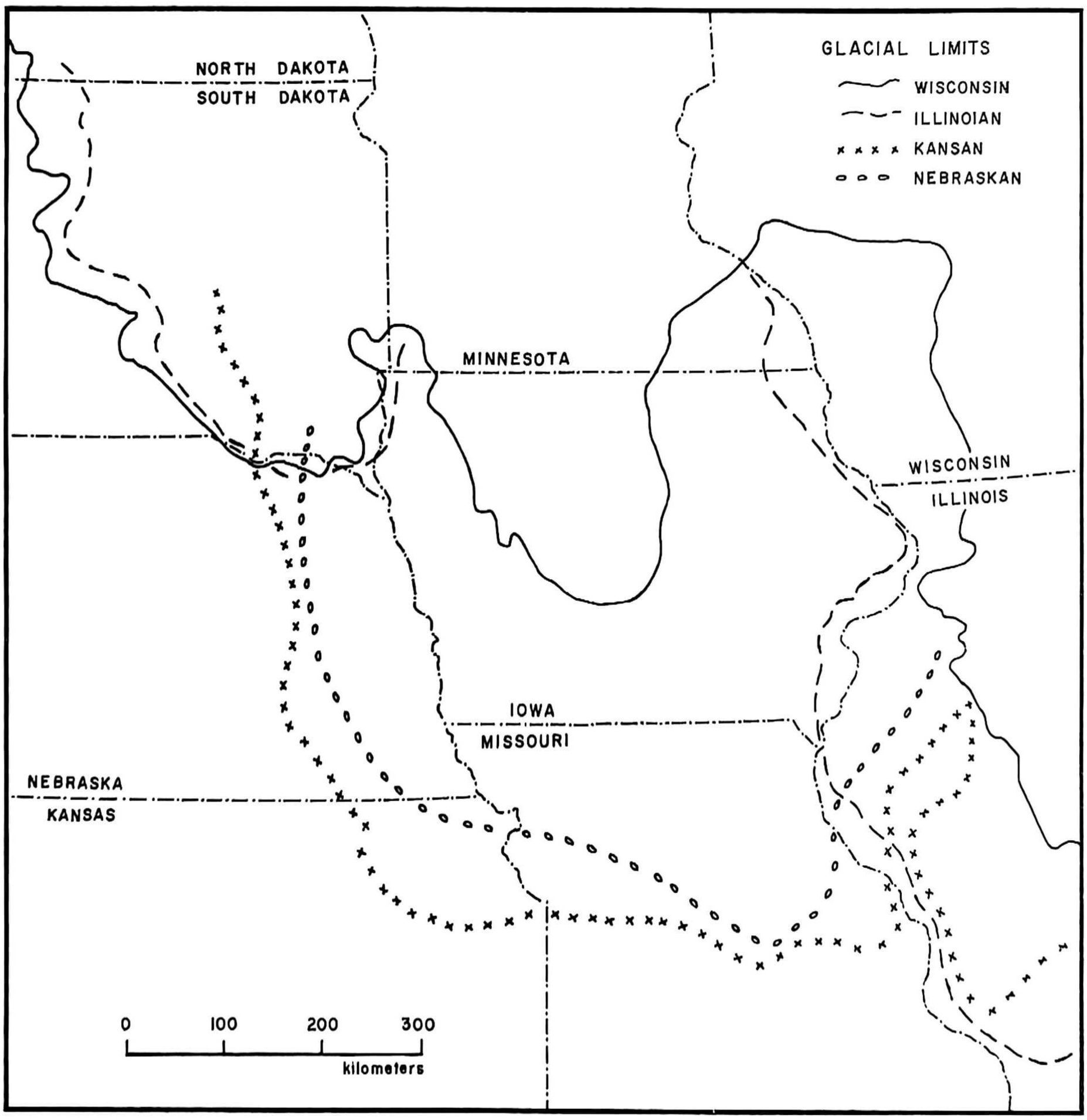


Figure 1 - Glacial stages in central United States.

The general effect of each ice advance was to deposit a thin, somewhat discontinuous blanket of glacial till composed largely of sedimentary rock debris derived from relatively local sources, but with an admixture of igneous and metamorphic boulders and cobbles brought all the way from the Canadian Shield. Especially conspicuous because of their color are fragments of reddish Sioux Quartzite that outcrops only in a small part of the tri-state area of Iowa, Minnesota, and South Dakota. During the retreatal phases, meltwater from the waning ice spread sand and gravel along proglacial valleys, and windblown dust accumulated to form layers of loess. Where local stability of land surfaces became sufficiently well established, weathering processes resulted in the development of soil profiles within whatever unconsolidated material was present at and close to that surface.

Each advance of the ice sheet resulted in some erosion, generally localized, of soil and sediment, but the greatest destruction of older materials and their record of past events apparently took place during the interglacial intervals and the long span of time after the ice freed this area forever. Erosion by streams, large and small, cut deeply and repeatedly, though not always at the same location, so that today the sedimentary record of Pleistocene events is fragmentary and difficult to interpret.

During at least the later part of Wisconsin time and, probably, extending into the Recent, the upland areas were the scenes of recurrent, climatically-controlled episodes of loess accumulation. Windblown dust, apparently derived in part from flood silts of the Missouri River and in part from the winnowing of finer particles from the great sand-dune areas of western Kansas and Nebraska, was deposited in successive layers that blanketed the hills bordering the Missouri Valley and partially filled smaller tributary valleys.

Large parts of the present landscape are a product of this lengthy history of widespread loess accumulation and the struggle of lesser elements of the drainage networks to either maintain or reestablish their courses. The rich upland soils in this area have been developed on these loess sheets.

The presence in northeastern Kansas and northwestern Missouri of glacial till containing fragments of Canadian rocks clearly shows that at least some of the glacier ice originated at high latitudes and travelled all the way to the terminus of the ice sheet. Nevertheless, it is probable that considerable quantities of ice were created from snowfall directly on the glacier margin, precipitation derived from air masses travelling generally northward from the Gulf of Mexico. The presence in northeastern Kansas and southeastern Nebraska of layers of glacial till separated by interglacial deposits and soils demonstrates that the margins of the ice sheets underwent marked fluctuations of position during both the Nebraskan and Kansan glaciations. It is presumed that these advances and retreats were the direct consequence of variations in climate either in the mid-continent region or northern Canada or both. Furthermore, it is probable that there were many lesser pulsations analogous to those especially well recorded by the many concentric moraines of Wisconsin age in the states bordering the Great Lakes and that these also were largely or entirely the consequence of climatic fluctuations.

Quantitative aspects of the various phases of Quaternary climatic fluctuations are only slightly known. Inferences have been based on such data sources as elevations of snowline, variations in lake levels, composition of soils, ranges of plants and animals, and isotopic studies, especially of oxygen. Former assumptions that glacial ages were both colder and wetter than the present are now

subject to considerable doubt. Indeed, some calculations suggest that the full-glacial climate was colder, but slightly drier than today's. It is extremely likely, however, that no simple statement will adequately express climatic comparisons for all parts of the world, or even interior North America; certainly it would not hold for all parts of the longer subdivisions of Quaternary time.

Discovery of an extensive assemblage of faunal remains in a gravel pit beside the Missouri River floodplain south of Wathena, Kansas has provided tantalizing information about the environment present at one moment in the past. Bones of pocket gophers, ground squirrels, mice, shrews, voles, lemmings, muskrats, fish, turtles and birds occur in silt layers beneath a till of presumed Kansan age. At present, however, the exact age and, therefore, the real significance of this find are not certain. Fragments of spruce wood have been found in till, also of presumed Kansan age, at Atchison and northwest of Wathena.

Details of latest Pleistocene and Recent climatic variations are better known even though still notably incomplete. The general model for North America shows the Late Wisconsin (Tazewell or Woodfordian, depending on the terminology accepted) full-glacial climatic episode extending approximately from 18,000 to 12,000 B.C. It was followed by progressive warming which reached a maximum somewhere around 5,000 B.C. This warmer, and perhaps drier, climatic interval is variously known as the Altithermal, Hypsithermal, or Climatic Optimum. Reversal of the trend brought on the cooling of the Neoglaciation (formerly called the Little Ice Age). The culmination of its latest (though perhaps not last!) cool episode occurred about A.D. 1800.

The best indications of late glacial and post-glacial climatic trends in the Kansas-Missouri area come from palynological studies. Pollen has been recovered from bogs at Muscotah, Kansas (20 miles

west of Atchison) and from Boney and Trolinger Springs, Missouri (100 miles southeast of Kansas City). These records, when added to those obtained from localities to the north of Kansas and Missouri, indicate that during the Late Wisconsin full-glacial climatic episode a boreal spruce forest covered the entire area westward from the Appalachian Mountains to the great sand-dune areas of central Kansas and Nebraska. The beginning of ice retreat probably caused or was accompanied by a decrease in wind action with consequent stabilization of the dunes and extension of the forest to the Black Hills. Accelerated warming and, perhaps, decrease in precipitation from 10,000 to 9,000 B.C. resulted in destruction of this forest. By 8,000 B.C., continuous prairie had become established in northeastern Kansas, while a birch-alder forest replaced the spruce farther east. Reversal of this climatic trend near 5,000 B.C. has resulted in some re-expansion of the forest into especially favorable sites.

The Trolinger Spring record of 30,000 to 23,000 B.C., coinciding with a relatively warm episode preceding the Late Wisconsin glacial advance, shows the presence of a mastodon-horse-muskox megafauna occupying an open pine parkland. At nearby Boney Spring, the record of 14,500 to 11,500 B.C., essentially coincident with the Late Wisconsin full-glacial climate, contains a mastodon-ground sloth-giant beaver megafauna in a dominantly spruce forest environment.

A.D.	1,800	
	3,000 B.C.	Neoglaciation
	8,000 B.C.	Altithermal
	9,000 B.C.	Valders glaciation
	10,000 B.C.	Two Creeks retreat
	12,000 B.C.	Tazewell glaciation
	18,000 B.C.	
Wisconsin glacial advances		
Sangamon Interglacial		
Illinoian glacial advances		
Yarmouth Interglacial		
Kansan glacial advances		
Aftonian Interglacial		
Nebraskan glacial advances		

TABLE I - Important climatic intervals.

PRESENT GEOMORPHOLOGY

Geomorphically, the area of northeastern Kansas and northwestern Missouri is a dissected plain sloping gently eastward. Thirty miles east of the Missouri River, elevation of this surface approximates 1,000 feet; an equal distance to the west, elevations approach 1,200 feet. The Missouri River and other major streams lie a bit more than 300 feet below this surface. Few remnants of the plain are identifiable close to the Missouri Valley, for even minor tributaries are deeply incised and dissection is extreme. Most of the recent erosion has been in loess. Therefore, bedrock cliffs are largely limited to the sides of the major valleys, and small creeks often flow in vertical-walled trenches cut entirely in either primary or reworked eolian silts. This latter relationship indicates that the Late Pleistocene loesses blanket a dissected terrain that had already been developed prior to the last episodes of eolian deposition and that present streams are mainly engaged in continuing or refurbishing former drainage lines.

The elevation of the Missouri River floodplain at St. Joseph is 800 feet. This is at Mile 448 above the confluence with the Mississippi River at St. Louis. At Kansas City, the elevation is 730 feet at Mile 366. Thus, the gradient of the river surface is on the order of 0.85 feet per mile. However, the gradient of the floodplain surface is about 1.23 feet per mile. For the period of 1928-1965, mean flow of the Missouri River at St. Joseph has been computed at 36,820 cubic feet per second. The maximum flow, recorded on April 22, 1952, was 370,000 cfs; minimum on January 19, 1937, was 2,300 cfs.

Variations in Quaternary climate resulted in consequent variations in the regimen of streams; minor changes affecting only the smaller streams, while major alterations of precipitation and temperature caused modification of flow and geologic activity of even the

largest rivers. Terraces and alluvial deposits along the valleys of the Kansas River and other main streams in Kansas have been tentatively correlated with the major glaciations, but there has been little study of features along the Missouri Valley. Certainly the elevation above sea level of the channel bed or floodplain has varied considerably through Quaternary time, being at times considerably lower and at times higher. Recent reconnaissance archaeological studies in the valley of Brush Creek, 12 miles upriver from Kansas City, have suggested that well-preserved terraces, clearly graded to a higher Missouri River base level, may be only a few thousand years old.

The floor of the Missouri Valley has been affected by almost continuous changes for at least the past few hundred years, and probably for considerably longer. Constant shiftings of the river channel led steamboat captains and pilots to consider the river a living adversary which many likened to a snake writhing back and forth between the bluffs that confined the floodplain. The simile is only partially apt because the river was a many-bodied snake as multiple channels threaded through mazes of sandbars and islands that grew larger or vanished, sometimes within a few days (Fig. 2).

The most recent maps of the Missouri River depict a single, broad channel with clearly-defined banks. This aspect of the river is the result of an intensive bank-stabilization program undertaken by the Army Corps of Engineers during the past few decades. It does not represent the natural state and presents a highly erroneous impression of what conditions on the floodplain would really be and how the river would behave if it were uncontrolled. It was the periodic inundation of the valley floor by

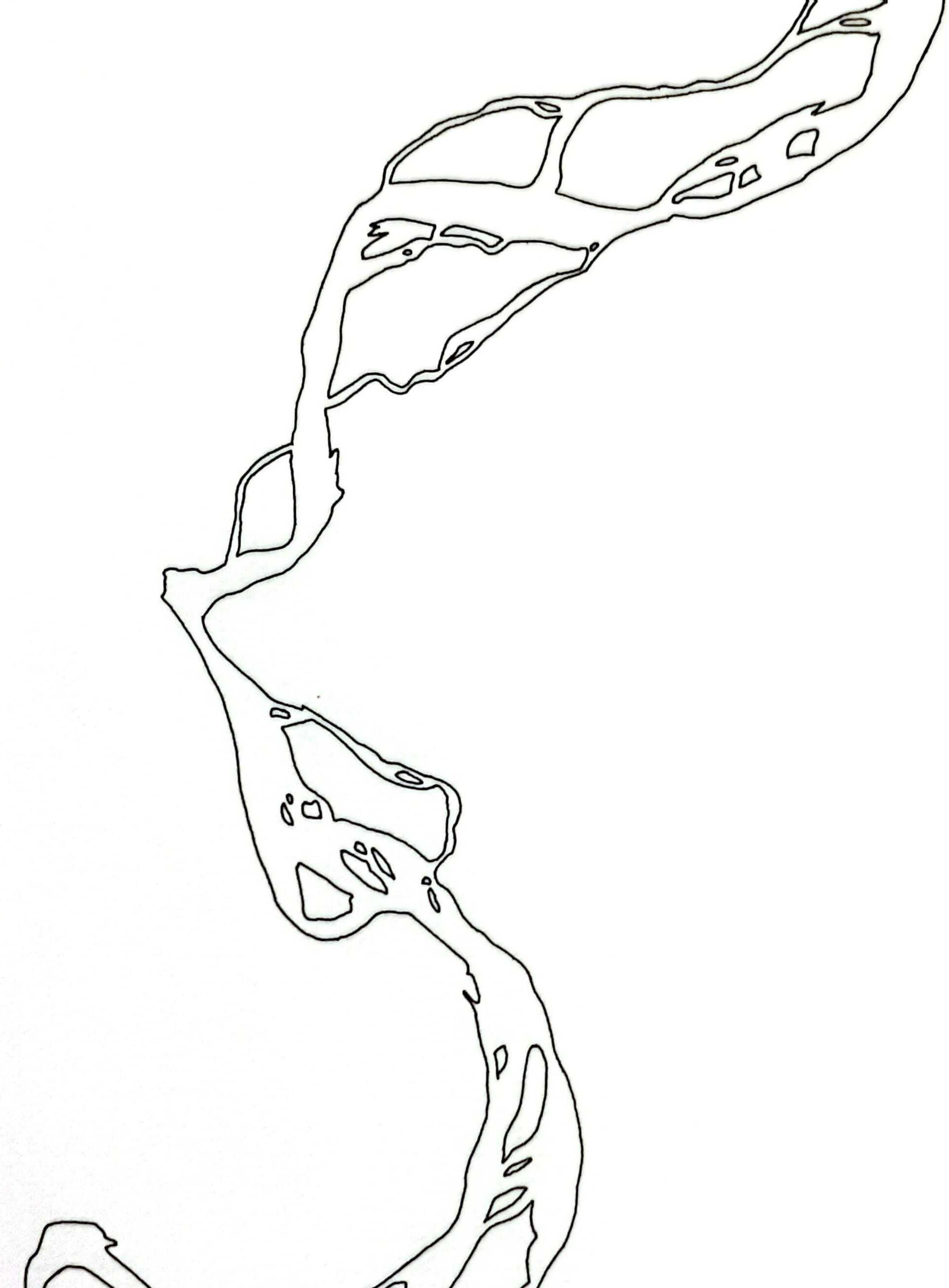


Figure 2

Sandbars and Braided Channels,
Steamboater's Nightmare

great floods and the constantly shifting, frequently divided river channels which, as they migrated, left behind lakes and swampy areas, that led the Indians to locate their settlements on higher, drier ground up the tributary valleys and forced white settlers to rebuild or relocate many times.

ABORIGINAL HISTORY

Although a few of their characteristic Clovis or Folsom fluted points have been found at scattered localities in the Great Plains region, no Paleo-Indian sites are known in or even near the Kansas City area. From bones recovered at kill sites in states to the southwest and west, it is apparent that Early Man hunted big game animals such as mammoth, mastodon, camel, and extinct forms of bison and horse. There is hardly any reason to doubt that these animals and Early Man were present together, at least at certain times, in Kansas and Missouri. The Clovis and Folsom points were apparently in use for periods of only about a thousand years each. These were during the final waning of the spruce forest in this area, probably an especially favorable time for hunting grazing and browsing animals.

Indians of the Archaic Period are known in Kansas and Missouri from a small number of sites that are situated on the tops of bluffs overlooking the main rivers and on the higher, older terraces of tributary valleys. They are small sites, probably hunting and gathering camps rather than main villages. Numbers of known sites increase toward the present. This may be a result of increasing population, or it may be a function of increasing preservation without later erosion or burial. The Early Archaic people lived in a time of generally ameliorating climate during which the last minor

pulses of the Wisconsin glacial episode were supplanted by increasing warmth. The Middle Archaic Period essentially coincides with the main Altithermal climatic interval, while during the Late Archaic the cooling trend of the Neoglaciation became established.

A major change in aboriginal cultures occurred near 500 B.C. and the Archaic was supplanted by the Woodland tradition. The latter apparently developed farther to the east and was carried westward to the Kansas City area about the time of Christ. The Middle Woodland, or Kansas City Hopewell people established villages near the mouths of major tributary streams and minor hunting and gathering camps on low terraces farther up these valleys. They hunted deer and small game, fished in the rivers, and raised minor amounts of corn and squash. They are especially well known from the custom of burying their dead in large mounds of earth. These mounds are fairly common in and north of Kansas City.

The local populations and living habits of these and subsequent peoples seem to have varied from time to time, probably as a result of fluctuations of climate that caused changes in the ease of hunting, gathering, or cultivating an adequate food supply. Because habitats suitable for the Indians' way of life were distinctly limited in number, favorable sites were occupied over and over again through time. As a consequence, in at least some valleys, camp or villages sites are spaced as closely as every few hundred feet or even overlap, although the population at any one time was probably exceedingly small.

Settlement of the eastern coast area of North America by whites provided a source of firearms that soon either upset existing balances between cultural units or hastened the displacement of already-oppressed weaker tribes. The powerful Iroquois, especially, forced other groups to flee westward. Therefore, the Indians found in Missouri by the first European explorers were themselves

actually recent immigrants from lands to the east. The Algonquin or Ojibwa family was represented here by the Illinois, Sauk (or Sac), Fox, Pottowatamie, Shawnee, and Kickapoo tribes. The Sioux or Dakota family included the Oto, Iowa, Kansa, Osage, and Missouri tribes. These two groups were hereditary foes, although individual tribes often shifted their allegiance. The result was a high frequency of inter-tribal wars, at least after the advent of the first white explorers in the mid-1600's, and progressive decimation of the Indians by each other. To this trend were added the terrible effects of smallpox spread by the whites and the debilitating consequences of forced migrations under the control of the United States Government. The last of these displacements occurred in 1837 when the Iowas, Sacs, and Foxes, through the Platte Purchase, relinquished all claims to land on the eastern side of the Missouri River north of Kansas City and in 1854 when they gave up their claims to land on the western side.

Paleo-Indian (Clovis, Folsom, etc.)	before 8,000 B.C.
Archaic	
Early	8,000 - 5,000 B.C.
Middle	5,000 - 2,500 B.C.
Late	2,500 B.C. - A.D. 1
Woodland	
Early	no local record
Middle (Kansas City Hopewell)	A.D. 1 - 500
Late	A.D. 500 - 1,000
Mississippian	A.D. 1,000 - 1,250
No Records Known	
Kanza, etc.	late 1600's

TABLE 2 - Aboriginal periods in the Kansas City area.

EUROPEAN EXPLORATION AND SETTLEMENT

During the first half of the Eighteenth Century, the main European influence in the present area of northwestern Missouri and northeastern Kansas was French. As early as 1703, Chevalier Le Seur is believed to have ascended the Missouri River as far as the mouth of the Kansas River (the present site of Kansas City). In 1724, Capt. Etienne de Bourgmont visited the Grand Village of the Kanza Indians at the present location of Doniphan, Kansas (5 miles north of Atchison) for the purpose of promoting inter-tribal peace and enlisting the aid of the Indians in repelling increasing Spanish influence from Mexico. A Jesuit mission was active at this Kanza village by 1727. French trappers, traders, and explorers ranged across all of the region, establishing small trading posts at various points along the Missouri River as well as on lesser streams. Only a part of this activity ceased when France formally ceded this land to Spain in 1768, and Frenchmen were still on the scene when the area was returned to France from Spain in 1800.

A new era began with the Louisiana Purchase by the United States in 1803, and the area became, in 1804, part of the District of Louisiana of the Territory of Indiana with Gen. W. H. Harrison as Governor. During that same year, the Lewis and Clark Expedition went up the Missouri River on their way to the Pacific Ocean. They celebrated July 4th at the present sites of Atchison and Doniphan, noting the ruins of the earlier Kanza village at the latter location. In 1805, this region was named the Territory of Louisiana, and in 1812 it became part of the Territory of Missouri. The State of Missouri was organized and admitted to the Union in 1821, its northwestern border being a line extending due north from the

confluence of the Kansas and Missouri Rivers. West of that line was the Platte Country, a region believed by the Indians to be holy ground and therefore reserved for their sole use.

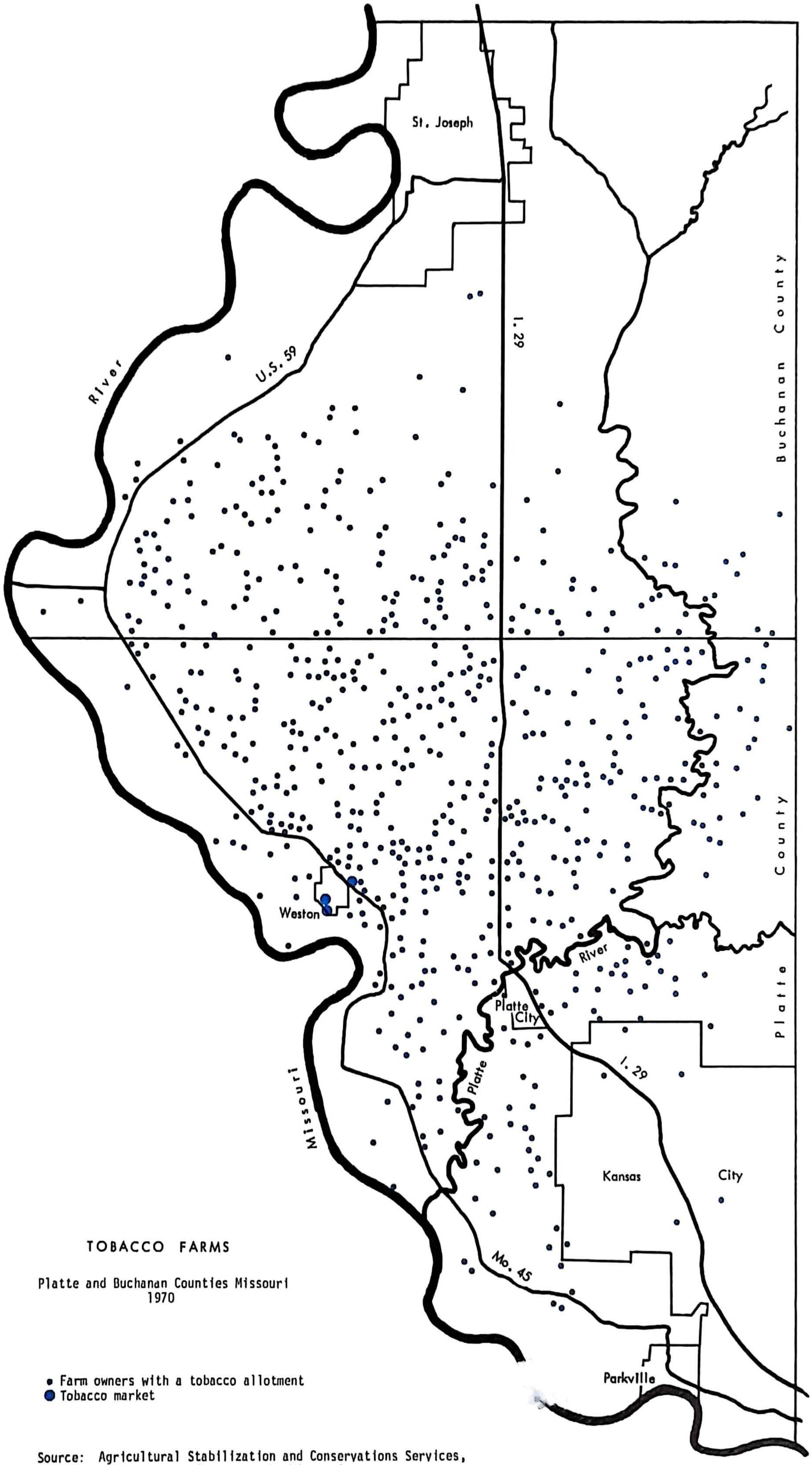
At the beginning of the Nineteenth Century, white population was largely confined to a strip along the Mississippi River in southeastern Missouri, but by the second decade of the 1800's immigrants had spread westward along the Missouri River to the central part of what was to be the state, and settlement reached all the way to the Kansas City area in the 1830's. Fort Leavenworth, Kansas had been established in 1827 as a base for troops to protect travellers on the Santa Fe Trail and, soon afterward, on other westward routes as well. Pressures increased for occupancy of the rich land of the Platte Country, and in 1837 this area along and east of the Missouri River was purchased from the Indians and opened to white settlement. People poured in, population of the southern tip of the area (now Platte County) reaching 4,500 in 2 years and 9,000 in 3 (10% were slaves). Town sites were laid off at many locations, some to prosper and some to quickly disappear. Parkville, Weston, and Iatan were all founded in 1837, Winthrop in 1839. St. Joseph had already been long established as a trading post, but turned into a bona fide town in 1838.

The settlers sought and cleared wooded areas in the hilly terrain, ignoring the lush upland prairies because they thought that the presence of grass indicated poor soil. Tobacco was planted at once as a source of ready cash to meet family needs, but was soon replaced by hemp which quickly became the real basis for the growing prosperity. Within a few years, Platte County was producing more hemp than any other county in the United States. As additional acreage was cleared of timber, grains were introduced and for a while Platte County was the leading wheat producer and second corn producer in Missouri.

Preparation of hemp for market required much hand labor, initially supplied by slaves. After the Emancipation, however, this source of manpower was lost and hemp production declined. Substitution of other rope-making materials and the introduction of steel bands finally destroyed local demand for hemp, and none was grown after the early 1870's. In contrast, tobacco cultivation underwent a renaissance about 1900 when burley was introduced from Kentucky. Weston is now the largest loose-leaf tobacco market west of the Mississippi, almost 5 million pounds being grown annually in Platte and Buchanan Counties (Fig. 3).

Many of the river-port towns prospered as commercial enterprises were established to serve the needs of the new residents of the Platte Purchase. Many immigrants, bound for Oregon, departed from these towns and trade along the Oregon and Santa Fe Trails became important. Shortly afterward, much of the overland rush of 1849 to the newly-discovered California goldfields passed through northwestern Missouri, creating an even greater increase in business.

During this period, lands to the west of the Missouri River were reserved for various Indian tribes, most of which had already been displaced at least once from farther east. Again white demands for additional space increased and Kansas Territory was opened for settlement in 1854, making possible the establishment of river-port towns on the western side of the river. Atchison and Doniphan were founded in 1855, Elwood and Wathena in 1856.



TOBACCO FARMS

Platte and Buchanan Counties Missouri
1970

- Farm owners with a tobacco allotment
- Tobacco market

Source: Agricultural Stabilization and Conservations Services, Platte City and St. Joseph, Missouri

TRANSPORTATION

The Missouri River was the main thoroughfare for travel through this mid-continental region by both Indians and early European explorers. Canoes (of the hollowed-log variety because birch bark was unavailable), pirogues, flat-bottomed batteaux, keelboats, and plank mackinaw boats were all in use. The first steamboats on that part of the river above the present site of Kansas City were those of Maj. Long's Yellowstone Expedition in 1819. Another brought Col. Leavenworth on his search for a suitable location for a new fort in 1827, and by 1829 there was a regular packet between the fort and St. Louis.

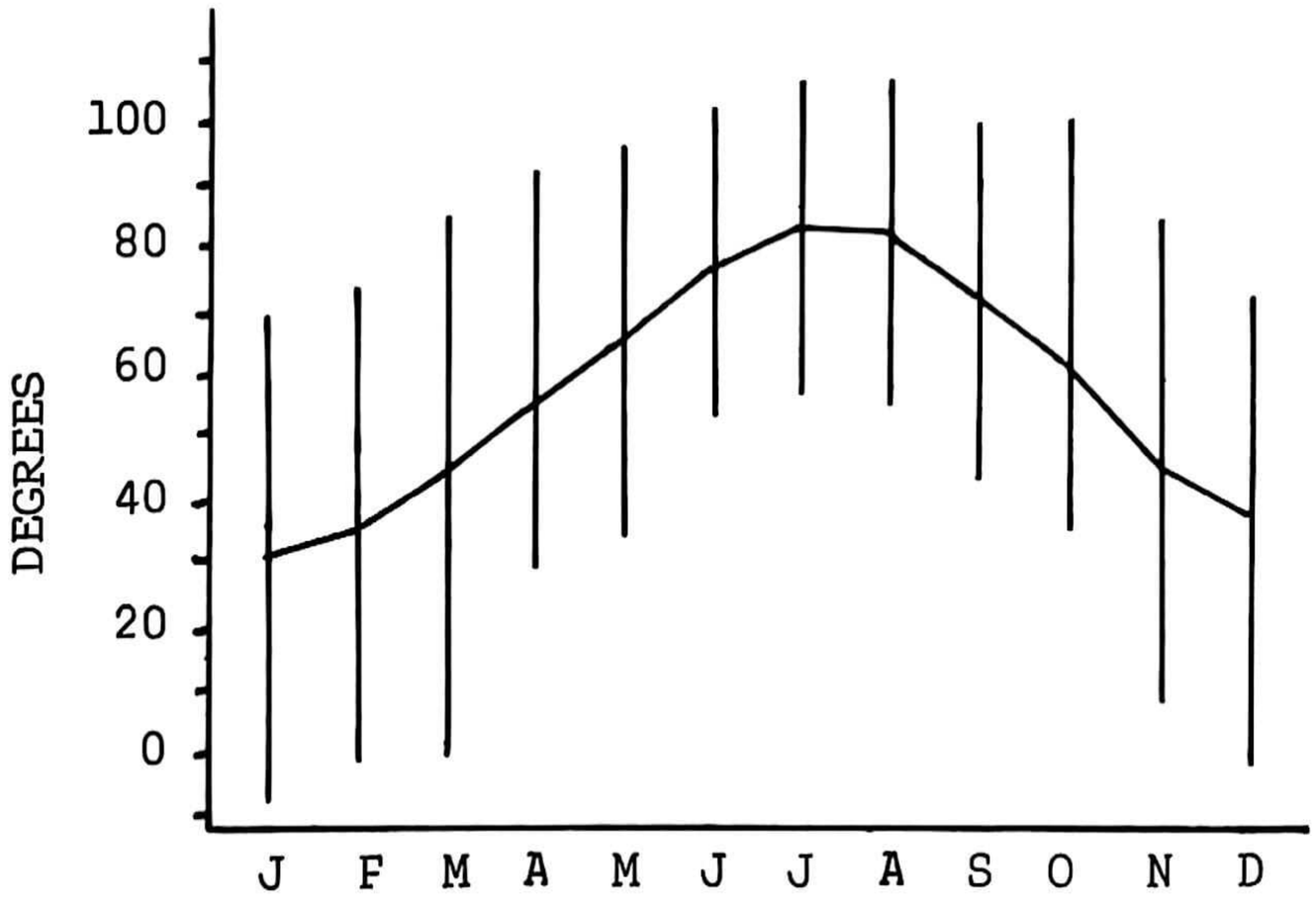
As soon as towns became established along the river after the Platte Purchase of 1837, commerce grew rapidly and steamboat traffic became heavy. Side-wheelers handled most easily around the sharp bends and snags. Early boats were 100-130 feet long and 20-30 feet wide, but at the peak of demand in the late 1850's, boats as large as 250 feet long and 40 feet wide carried as many as 400 passengers in considerable luxury. Speed of course varied with the size of the boat, the record from St. Louis to St. Joseph being 60 hours. Wrecks on snags and sandbars were extraordinarily numerous.

Steamboating began a rapid decline in 1859 when the Hannibal and St. Joseph Railroad completed rail connection with the East. At once, additional rail lines began to spread outward. By 1860, the first railroad west of the Missouri River extended all of 4 miles from St. Joseph to Wathena. Also in 1860, a railroad was built from St. Joseph to Winthrop (across the river from Atchison), and soon there was a connection with Kansas City. However, much of the initial railroad boom was only on paper and many proposed lines were never built, or were extensively reorganized, refinanced, and renamed.

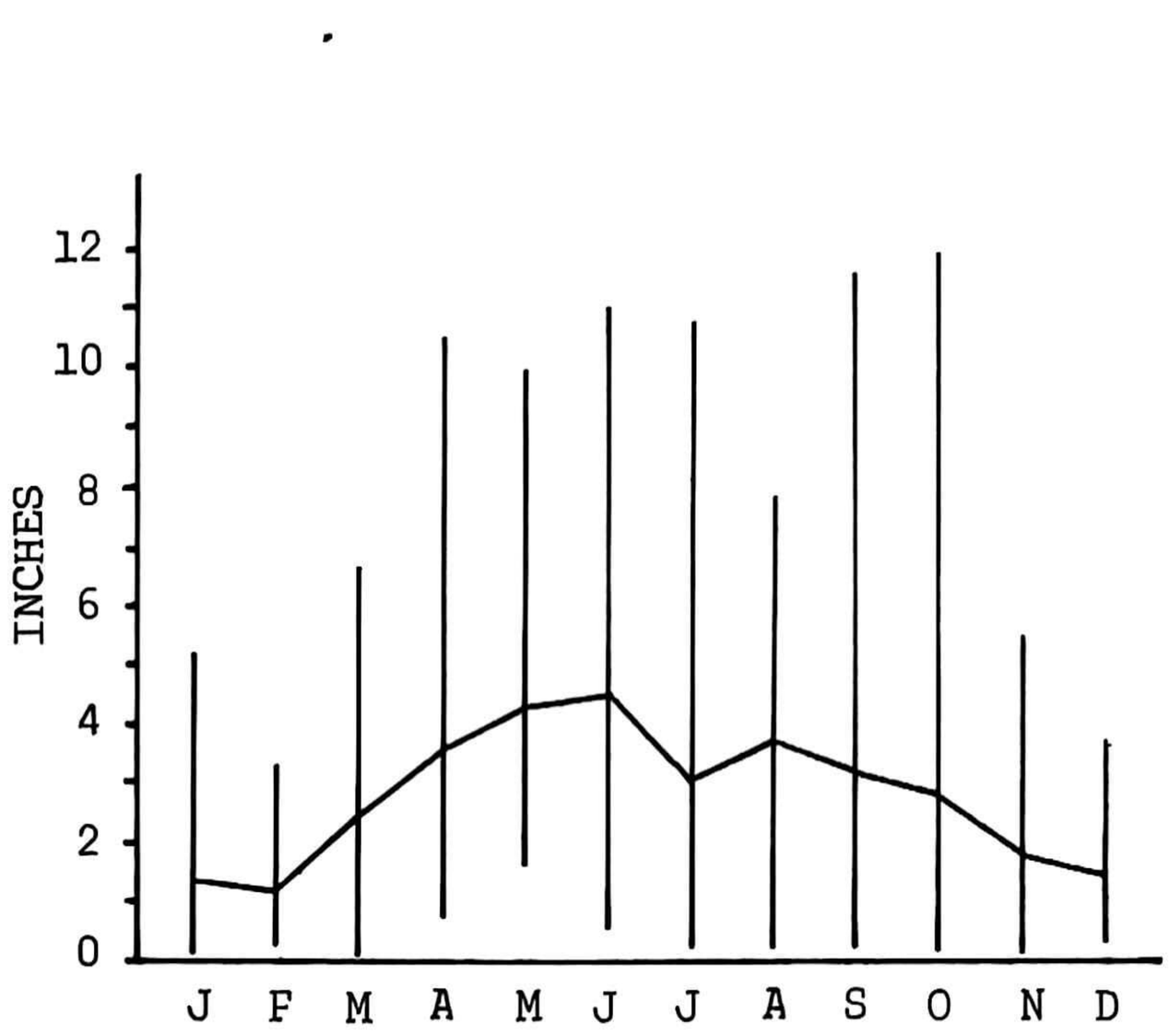
CLIMATOLOGY

Kansas City is located in the Great Plains heartland of the United States, not far from the geographical center of the conterminous part of the country. Because there are no topographical obstructions for great distances in any direction, this region is affected by air masses that originated hundreds of miles away, not from just one direction, but from several. Severe frontal storms can result from interaction of warm, moist Gulf Maritime air meeting cold Polar Continental air, and the difference between flood and drought may depend on whether dominant air arrives from the Gulf of Mexico or the arid Southwest.

Major summer precipitation is of convectional origin, with major squall lines or storm fronts advancing from the southwest. Thunderstorms are common and frequently severe; there may be associated tornadoes. Most winter precipitation is of frontal origin. Maritime Tropical air advancing from the Gulf of Mexico to the south interacts with Polar Continental air coming from the north. Generally lesser amounts of precipitation may be derived from Maritime Pacific air that has crossed the entire mountainous belt of the West. The possible permutations between these air masses makes for highly variable precipitation, as is shown by the graph on the next page. However, as a general rule, more than 70% of the annual precipitation occurs during the April through September period. The maximum daily frequency of precipitation occurs between midnight and 6:00 AM, the minimum between noon and 6:00 PM.



Mean and extreme Kansas City temperatures



Mean and extreme Kansas City precipitation

CLIMATIC DATA FOR KANSAS CITY

Mean annual temperature	56.8°
Maximum temperature	104°
Minimum temperature	-9°
Days 90° and above	42
Days 32° and below	98
Days 0° and below	4
Mean annual precipitation	34.07 inches
Maximum monthly precipitation	11.94 inches
Minimum monthly precipitation	0.04 inches
Maximum precipitation in 24 hours	5.96 inches
Mean annual snowfall	21.0 inches
Maximum monthly snowfall	30.5 inches
Maximum snowfall in 24 hours	12.8 inches
Mean relative humidity:	
midnight	69
6:00 AM	75
noon	56
6:00 PM	55
Mean wind velocity	10 mph
Maximum wind velocity	72 mph
Percent possible sunshine	64
Mean daytime sky cover	5.6
Days clear	118
Days partly cloudy	105
Days cloudy	142
Days with precipitation	99
Thunderstorms	50

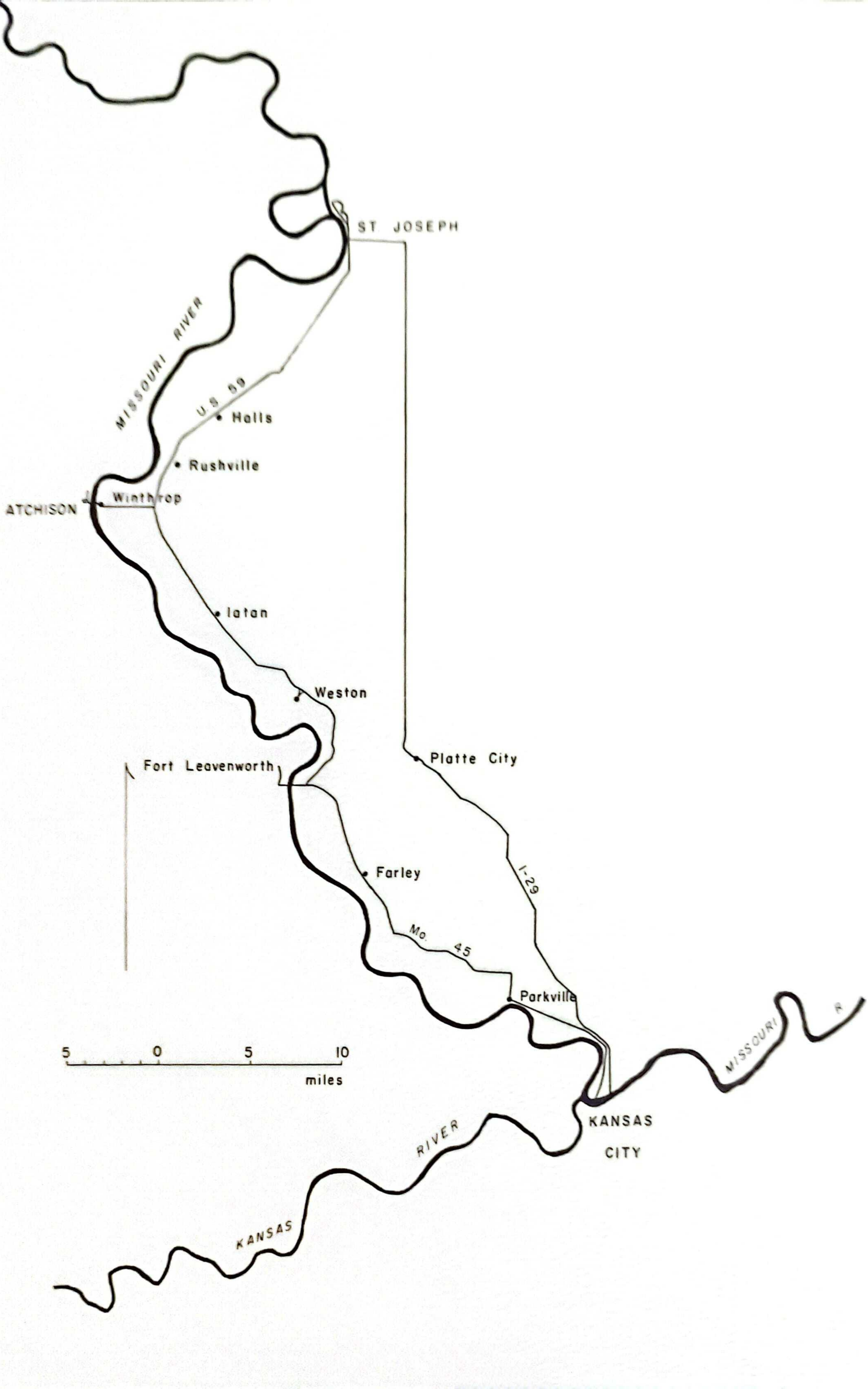
Source: U. S. Weather Bureau, Local Climatological Data, 1965

SOILS

The terrain of northwestern Missouri and northeastern Kansas can be conveniently subdivided into three parts, the gently rolling upland surfaces, the steep, sometimes rocky valleyside slopes, and the level floodplains. When first seen by white men, the uplands were nearly unbroken prairie grasslands and, because it was believed that grass was indicative of poor soil, were avoided for initial agricultural endevours. In contrast to the botanically relatively simple uplands, the valley slopes and floors were occupied by complex deciduous forests. Common trees included black walnut, bur and white oaks, cottonwood, hickory, elm, honey locust, wild cherry, ash, and sugar maple. Many of the early settlements had at least one sawmill to provide lumber for local markets.

VEGETATION

The pattern of soils present in the Missouri Valley area is fairly simple. Rich alluvial soils lie on the floodplains, and equally rich loessial soils are present in and near the dissected bluff land along the river. Farther away from the valley, where loess is thin or absent, there are glacial soils developed mainly on deeply weathered till of Kansan age, and residual soil resting on its limestone bedrock parent material. Rubbly colluvial soil is present on the steepest slopes on and below outcrops of especially resistant limestone units.


ST JOSEPH
MISSOURI RIVER
U.S. 59
Halls
Rushville
Winthrop
ATCHISON
Iatan
Weston
Fort Leavenworth
Platte City
Farley
I-29
Mo. 45
Parkville
MISSOURI R.
5 0 5 10
miles
KANSAS RIVER
KANSAS CITY

FIELD TRIP LOG

STARTING POINT is at the west door of the Muehlbach Hotel in Kansas City.

Mileage

0.0 Follow one-way streets south and west to Broadway, then north on Broadway.

1.0

1.0 Cross the Broadway Bridge over the Missouri River. Mile 366 above St. Louis is located a few hundred feet downriver, almost at the point where the first trading post was built by the French in the early 1700's. The confluence of the Kansas (or Kaw) River with the Missouri is about a mile upstream. This river, the largest in Kansas, drains approximately half of the state, plus part of southern Nebraska and a little of northeastern Colorado.

0.7

1.7 Kansas City Municipal Airport to the LEFT. This facility, dedicated by Charles Lindbergh in 1927, is hemmed in by the river on three sides and an extensive rail and industrial complex on the fourth, thus having no room for expansion. Most operations will shortly move to Kansas City International Airport now under construction 14 air miles to the north. The present airport ranks 17th in the United States in passenger traffic and handles about 400 flights per day.

1.4

3.1 Burlington Northern freight yards to the RIGHT. Trains arrive here from the northwest (Portland and Seattle), the north (Minneapolis), and the east (Chicago and St. Louis). This modern classifying yard is entirely computerized so that incoming trains are broken down, the cars sorted, and outgoing units made up automatically. Cars pushed over the hump, which is visible from the highway, are switched by the computer and automatically braked so that impact with other cars is no more than 4.5 mph. About 2,000 cars can be classified per day, although the entire yard operation has handled as many as 5,000 cars in a single day. Average yard-time for a car is less than 6 hours.

1.0

4.1 Kansas City Municipal Water Works to the RIGHT. This plant, opened in 1928, has a capacity of 210 million gallons per day. During the past 12 months it supplied an average of 3.2 billion gallons per month to all of Kansas City, Missouri and large parts of the adjoining urban area. All of this water comes from the Missouri River (the intake structure is to the LEFT). The water passes through three groups of settling basins, plus filtration units, and is treated with lime, soda ash, chlorine, ammonia, ferric sulphate, aluminum sulphate, carbon dioxide, and carbon.

The roadcut almost directly ahead reveals a considerable thickness of loess overlying limestone bedrock. Many similar, though less spectacular exposures will be seen along the Missouri Valley during this trip.

0.5

4.6 The route joins Missouri Route 9 and proceeds northwesterly along the edge of the Missouri River floodplain. The limestones and shales exposed along the highway are Upper Pennsylvanian in age.

5.4

10.0 Park College to the RIGHT. This college was established in 1875, chartered in 1879. MacKay Hall, the prominent, turreted building high on the slope, was completed in 1893.

0.2

10.2 PARKVILLE

The town was founded in 1838 and was briefly known as English Landing before receiving its present name. Prior to then, the site had been occupied by Indians at various times and a French trapper named White Alloe reportedly lived there in a cave or dugout. The town became an important river port and market place for tobacco, hemp, and slaves. In 1840 females sold for $300-350, men for $500-600, and small children only 2 to 4 years old for $100-200. By the late 1850's these prices had increased almost threefold. The town was soon eclipsed by Westport Landing (later named Kansas City) and river towns to the north; its demise was assured when the river gradually migrated away in the early 1900's. The Platte River originally joined the Missouri at Parkville (Fig. 5), but was captured 6 miles upstream in 1875.

The highway turns north, leaving the Missouri Valley and climbing towards a general upland 250 feet above the river.

1.6

11.8 Turn LEFT (westerly) on Missouri Route 45.

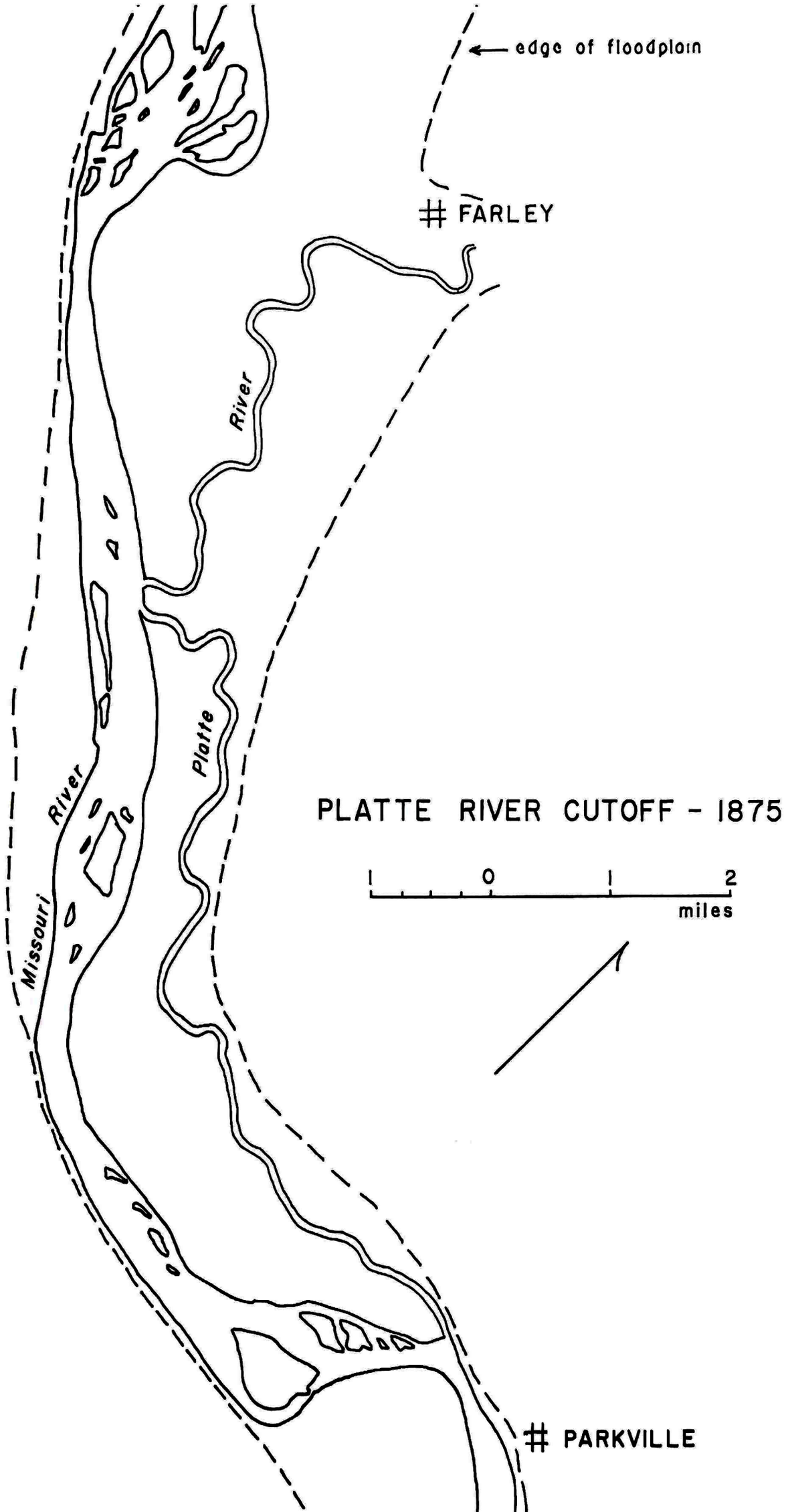
1.5

13.3 STOP. Roadcut across from small shopping center exposes at least two loess units separated by an incipient paleosol or buried soil indicative of a pause in eolian sedimentation. These loesses are probably of Late Wisconsin age.

0.4

13.7 Valley of Rush Creek. Note the flight of low terraces which indicate a complex history, probably coupled to that of the Missouri Valley only a mile away.

The route passes through an area of highly dissected slopes eroded on loess-covered bedrock. Higher vantage points provide views of accordant summits and distinct upland areas to the north (RIGHT). These have elevations of about 1,000 feet above sea level. When white settlers first entered this


edge of floodplain
FARLEY
River
Platte
River
Missouri
PLATTE RIVER CUTOFF - 1875
0
2
miles
PARKVILLE

region, the uplands supported lush prairie and the dissected slopes were forested, much as is seen now along this part of the route. The settlers thought the forested land should be cleared for cultivation, but modern immigrants from the city established only small clearings for their suburban "estates."

2.7

16.4 Valley of Brush Creek, also with low, poorly-defined terraces. It is planned that an express highway from Kansas City to the new airport will be built along the axis of this valley. A major program of salvage archaeology has therefore been undertaken by the University of Kansas. Preliminary findings suggest that Archaic sites are restricted to remnants of the higher terraces, but the later, Woodland and Mississippian peoples occupied the lower terrace surfaces.

1.9

18.3 Long roadcut on RIGHT exposes at least two loess units separated by an incipient soil. Between the loesses and the limestone bedrock the presence of pebbles, including pieces of pink Sioux quartzite, indicates a glacial till. It is probably of Kansan age.

0.6

18.9 The route enters the floodplain of the Missouri River again and proceeds along the base of the bluffs in a north-northwesterly direction.

1.4

20.3 The bluffs draw back toward the east into an embayment eroded by the Platte River.

1.6

21.9 The highway crosses the Platte River, now being straitjacketed by the levees of the Army Corps of Engineers. This stream used to meander sinuously and, for a long period, was a true yazoo tributary flowing parallel to the Missouri for several miles before finally effecting a junction (Fig. 5). During the great flood of June, 1844, several steamboats navigated more than 10 miles of the Platte Valley, reaching Platte City.

0.5

22.4 FARLEY. Founded 1838.
Large buildings visible across the Missouri Valley include parts of the Kansas State Penitentiary at Lansing and St. Mary's College and the Veterans Administration Hospital south of Leavenworth.

3.2

25.6 Turn LEFT on cut-off to Leavenworth. The route crosses the Missouri River floodplain, which is slightly less than 3 miles wide at this point.

1.5

27.1 To the RIGHT, Mud Lake is an oxbow lake formed when a meander of the Missouri River was cut off sometime prior to the mid-1800's.

1.5

28.6 The highway crosses the Missouri River a few hundred yards downstream from Mile 398.

0.7

29.3 Turn RIGHT onto the Fort Leavenworth Military Reservation and proceed northerly on Grant Avenue.

1.1

30.4 Turn RIGHT on Stimson Avenue and follow along the top of the bluff.

0.6

31.0 STOP. Overlook.

FORT LEAVENWORTH

Founded in 1827 by Col. Henry Leavenworth in response to increasing demand from traders with Mexican territory to the southwest for protection from Indian attacks. The site was selected after search of the eastern side of the Missouri Valley failed to locate a suitable spot. The first troops apparently arrived by steamer, although a contemporary newspaper reported their departure in keelboats from near St. Louis. A road from a point across the river from the new fort was built to the town of Liberty just northeast of Westport Landing (Kansas City) in 1828. The first military escort for travellers from Westport to Santa Fe was provided in 1829, the soldiers going only as far as the Border of Mexican territory on the Arkansas River.

Continue on Sherman Avenue and Scott Avenue.

0.5

31.5 Turn RIGHT and go down bluff toward river.

0.2

31.7 In the 1830's, when the river ran close to the base of the bluff, a boat landing was located at this spot where branches of the Santa Fe and Oregon trails crossed the Missouri. Heavily loaded wagons, being pulled up the steep bluff, cut the broad furrow that now scars the slope.

Continue back up the bluff, turn LEFT on Riverside Avenue, and continue southerly on Grant Avenue to the front gate of the reservation. Turn LEFT toward river.

2.9

34.6 Recross the Missouri River. Proceed northeasterly on Missouri Route 92.

3.1

38.4 Junction with Missouri Route 45. Proceed northward, leaving the floodplain of the Missouri River and entering dissected terrain, mostly under cultivation.

1.9

40.3 Tobacco barns ahead. Although this is not the true limit of tobacco cultivation in the area, these are the first readily visible signs of such activity. (Fig. 3)

0.5

40.8 Turn LEFT on County Route JJ. One of the area's largest orchards lies to the RIGHT. Tobacco seed-beds may be seen along the route. Some of the farm houses have architectural styles brought from Virginia and Kentucky in the early to middle 1800's. A side road leads to the McCormick Distillery, purported to be the oldest continuously-operating distillery in the United States. Its site was selected for proximity to a large spring source of water.

The route enters the town of Weston, going towards the river on Main Street.

2.5

43.3 **STOP in parking area of former railroad station.**

WESTON

Figure 6 - Weston in the late 1840's.

First white settlement in this area was a French trading post present on the western side of the Missouri Valley at the mouth of Salt Creek in the 1750's. This was the continuing site of a major village of the Kanza Indians, and the French Fort Cavanaugh was also located there. As early as 1819, a French trading post known as Pensineau's Landing or Rialto had been established on the eastern side of the river about a mile downstream from present Weston. It became a major source of liquor for soldiers from Fort Leavenworth and was closed down by the military in 1840. Meanwhile, the town of Weston was founded in 1837 and quickly became the leading commercial metropolis of western Missouri. The first settlers, coming from Kentucky, Tennessee, and Virginia, needed quick-yield cash crops. They started with hemp the first year, then added tobacco while clearing land for grain. Tobacco and, especially, hemp required a large labor force. When Emancipation freed the slaves, cultivation of both crops essentially ended. The tobacco market was revived near the turn of the century and continues at present. Weston is now the largest loose-leaf tobacco market west of the Mississippi.

Early in its history, Weston was a major river port (Fig. 6) and shipping center, sending wagon trains to Santa Fe and Salt Lake City. However, the river channel gradually migrated away (Fig. 7), effectively destroying the port in 1858, and completion of a railroad from the Mississippi to St. Joseph, 20 miles north of Weston, diverted most of the overland trade in 1859.

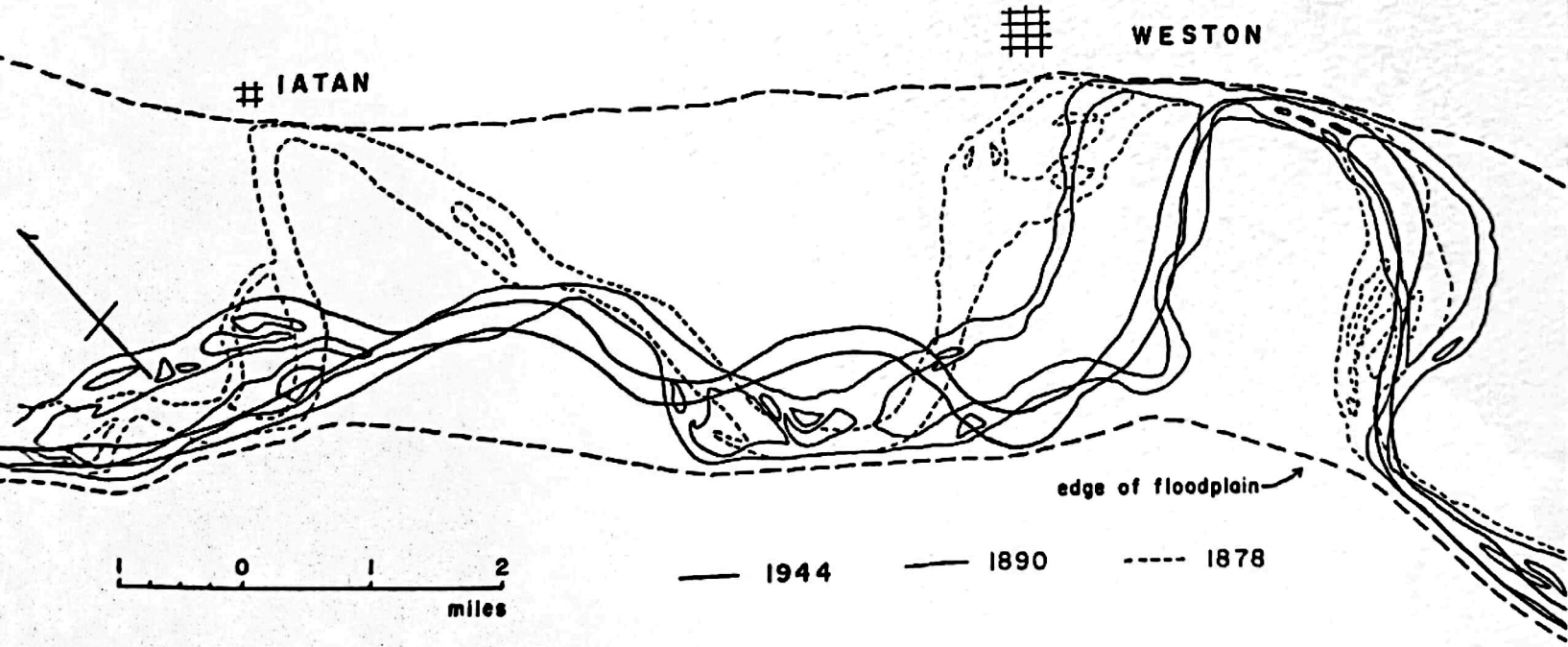


Figure 7 - Changes in the Missouri River channel near Weston. Note that none of these channels is the same as that shown in Figure 6.

4.0

79.7 Horseshoe Lake to the LEFT, another cut-off meander. Between Kansas City and St. Joseph, all of the prominent cut-off meanders lie on the eastern side of the present channel of the Missouri River. The significance of this relationship is not as yet understood.

2.2

81.9 The highway climbs the scarp of a low terrace, the scarp being the eastern side of a former meander.

1.5

83.4 The large buildings to the LEFT FRONT are part of the stockyards complex. Meat processing is a major industry here.

4.2

87.6

ST. JOSEPH

In 1799, Joseph Robidoux visited this spot while on a trading expedition up the Missouri River. He returned in 1826 and established a trading post for John Jacob Astor's American Fur Company. In 1830 he purchased the post, thereby becoming sole owner of "Blacksnake Hills." His 9-room house stood at what is now the northwest corner of Jule and 2nd Streets. He employed some 20 French traders and owned several slaves. The place was renamed St. Joseph in 1843.

St. Joseph was the point farthest upriver that had direct communication with the East. It therefore became a trapper's resupply base and the jumping-off place for immigrants heading for Oregon. In 1849, thousands of travellers passed through St. Joseph en route to the newly-discovered goldfields in California. Between April and June, 1500 prairie schooners left St. Joseph for the west, and many more crossed the Missouri at other locations nearby. Business pressures created by these hordes resulted in the erection of almost 200 buildings in one year, many of substantial brick construction. Demand for meat gave rise to a large livestock trade. Cows cost $10 in St. Joseph, but were worth $150 in California. Therefore, large numbers were driven westward, 10,000 in May, 1853 alone. Later, cattle were driven all the way from Texas to the St. Joseph stockyards. Soon after the California gold rush began to abate, gold was discovered in Montana and a new wave of migration began. In 1859, the railroad reached St. Joseph from Hannibal on the Mississippi, and in 1860 the famous, though short-lived Pony Express provided 8-day mail service to California, an uneconomical luxury as soon as the telegraph was completed.

St. Joseph continued to flourish, becoming the 3rd largest city in Missouri and reputedly the wealthiest city per capita in the United States in 1890. In 1941, the city ranked as the 10th largest flour producer in the world, and had the 5th largest livestock market.

Continue north on 6th Street.

0.3
87.9 LEFT on Faraon Street, LEFT on Main Street, RIGHT on Jule Street, then northwards along the river.

0.8
88.7 STOP. High bluff provides unusually excellent exposure of several loess bodies with intervening weathering zones.

Continue along river.

0.7
89.4 Turn RIGHT, proceeding east on Chestnut Street, RIGHT on Prospect Street, RIGHT on Poulin Street.

1.2
90.6 STOP. Wyeth Park overlook of the Missouri River Valley. Mile 450 is directly below. Until recently, the river followed a horseshoe-shaped curve to the west at this point (Fig. 8). A cutoff was achieved during the flood of April, 1952. The channel formed at that time is the marshy lake just west of the present course, which was cut by the Army Corps of Engineers for ease of navigation. The 1952 flood provided the maximum volume of flow of the Missouri River ever recorded - 370,000 cubic feet per second on April 22. This compares with a mean flow of 36,820 cfs for the period 1928-1965, and a minimum flow of only 2,300 cfs on January 19, 1937.

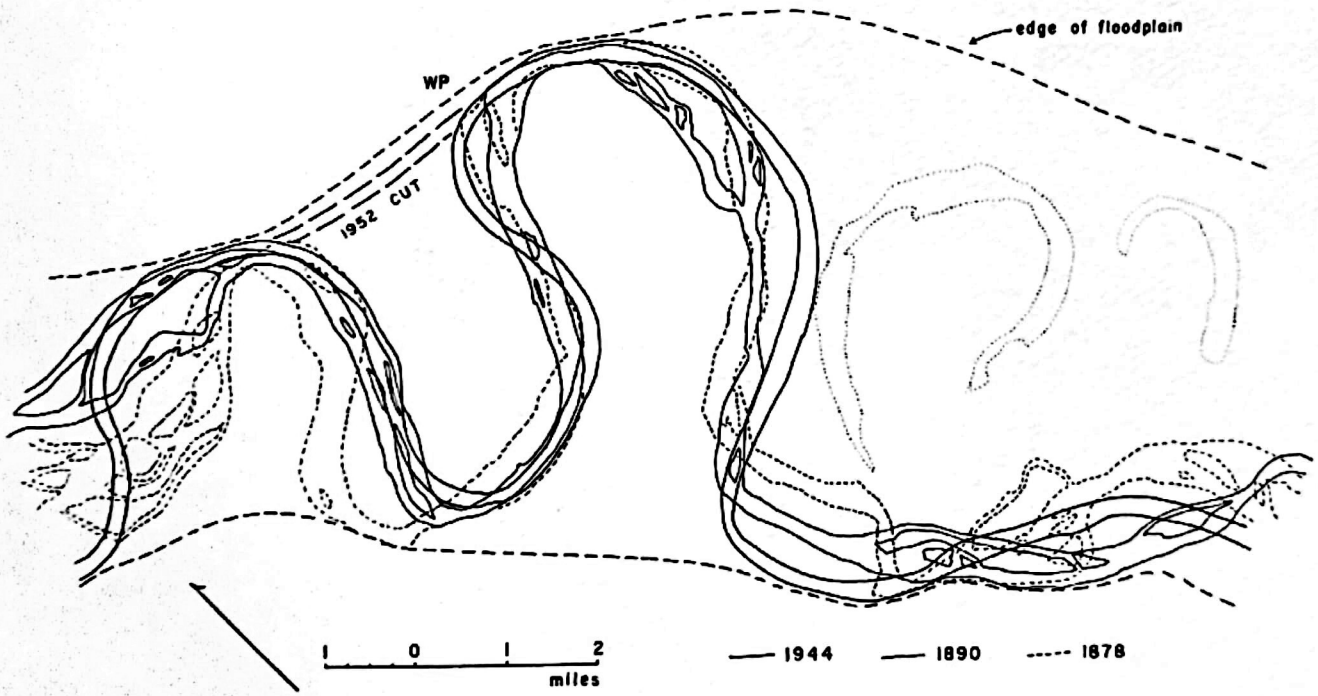


Figure 8 - Changes in the Missouri River channel near St. Joseph. WP indicates location of Wyeth Park.

Prior to the 1952 cutoff, the river course followed an S pattern. Inside the eastward loop the town of Elwood was founded (under the name Roseport) in 1856. It grew rapidly, but migration of the river soon began to erode it away until, in the late 1870's, there was no town whatsoever. When the river retreated, the town was reborn.

Return eastward on Poulin Street, turn RIGHT on Dewey Street, LEFT on Franklin Street.

0.9

91.5 Turn RIGHT (south) on 4th Street, proceeding through the center of the city.

1.8

93.3 Turn LEFT onto U.S. Route 36 east-bound.

3.5

96.8 Turn RIGHT onto Interstate 29 south-bound.

Note that the dissection of the upland surface is considerably less than that seen close to the river, and the loess cover on top of the bedrock is either very thin or completely absent.

24.9

121.7 Exit on Missouri Spur 92.

0.9

122.6 Continue southward on Missouri Route 92.

0.7

123.3 The highway crosses the Platte River. Note that the channel is very narrow, yet steamboats reached this point during the flood of 1844. Furthermore, when the military road from Liberty to Fort Leavenworth was built through here in 1828, the river was fordable only because a great slab of rock created a very broad channel through which the water was only a few inches deep at normal flow. At the end of this slab there was a 6-foot waterfall, of which there is no sign today.

0.1

123.4 PLATTE CITY. Founded in 1829 when Zadoc Martin established a ferry for the Fort Leavenworth road. Called Martinsville, it was renamed in 1839.

0.1

125.1 Rejoin Interstate 29 and continue southward.

2.4

127.5 Kansas City International Airport to the RIGHT, a $250,000,000 development soon to be opened.

21.3

148.8 Return to the Hotel Muehlbach in Kansas City.

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